DPS 2001 meeting, November 2001
Session 5. Cassini and Galileo at Jupiter II
Oral, Chairs: R. Lopes, A. Simon-Miller, Tuesday, November 27, 2001, 2:00-3:20pm, Regency E

[Previous] | [Session 5] | [Next]

[5.04] Cassini, VLA and DSN Observations of Synchrotron Emission from Jupiter's Radiation Belts

S.J. Bolton, M. Janssen, S. Levin, M. Klein, S. Gulkis, C. Elachi (Jet Propulsion Laboratory, Caltech), R. Thorne (Department of Atmospheric Sciences, UCLA), T. Bastian (National Radio Astronomy Observatory), R. Sault (Australia National Telescope Facility), G. Dulk, Y Leblanc (Observatory of Paris), R. McLeod, J. Roller (Lewis Center for Educational Research)

We report on new measurements of Jupiter's synchrotron emission from Cassini, the Very Large Array (VLA) and the NASA Deep Space Network (DSN) obtained during Cassini's flyby of Jupiter. On January 2-3, 2001, on route to Saturn, measurements of Jupiter's synchrotron emission were carried out using the radiometer subsystem of the Cassini Radar Instrument operating at 2.2 cm (13.8 GHz), the VLA operating at 20 cm (1400 MHz) and 90 cm (333 MHz) and the DSN operating at 13 cm, 3.5 cm, and 2.2 cm. The data provide new information on a wide range of energetic electrons trapped in Jupiter's magnetosphere (~5 to >50 MeV). At frequencies above 100 MHz, Jupiter's radio emission is comprised of both thermal emission from the atmosphere, and non-thermal synchrotron emission generated by relativistic electrons trapped in Jupiter's radiation belts. Earth-based radio telescopes cannot accurately measure and map the synchrotron radiation at wavelengths shorter than about 6 cm due to the difficulty of separating the thermal atmospheric emission from the non-thermal synchrotron emission. Because in-situ measurements of the electrons are limited, investigations are largely dependent on ground-based observations. The observations provide the first accurate measurement of Jupiter's synchrotron emission at 2.2 cm and the first high resolution maps depicting the distribution of ultra-relativistic electrons (> 50 MeV) near Jupiter. The results suggest that the relativistic electrons have a softer energy spectrum than expected, and as a result, electrons between 5-20 MeV may be more abundant than previously realized.

Acknowledgements: The research reported in this paper was performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

The author(s) of this abstract have provided an email address for comments about the abstract:
scott.j.bolton@jpl.nasa.gov

[Previous] | [Session 5] | [Next]